



King's Research Portal

DOI:

[10.1093/fampra/cmz102](https://doi.org/10.1093/fampra/cmz102)

Document Version

Peer reviewed version

[Link to publication record in King's Research Portal](#)

Citation for published version (APA):

Mastellos, N., Bliniuk, G., Czopnik, D., McGilchrist, M., Misiaszek, A., Bródka, P., Curcin, V., Car, J., Delaney, B. C., & Andreasson, A. (2016). Feasibility and acceptability of TRANSFoRm to improve clinical trial recruitment in primary care. *Family Practice*, 33(2), 186-191. [cmv102]. <https://doi.org/10.1093/fampra/cmz102>

Citing this paper

Please note that where the full-text provided on King's Research Portal is the Author Accepted Manuscript or Post-Print version this may differ from the final Published version. If citing, it is advised that you check and use the publisher's definitive version for pagination, volume/issue, and date of publication details. And where the final published version is provided on the Research Portal, if citing you are again advised to check the publisher's website for any subsequent corrections.

General rights

Copyright and moral rights for the publications made accessible in the Research Portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognize and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the Research Portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the Research Portal

Take down policy

If you believe that this document breaches copyright please contact librarypure@kcl.ac.uk providing details, and we will remove access to the work immediately and investigate your claim.

Title: Feasibility and acceptability of TRANSFoRm to improve clinical trial recruitment in primary care

Article category: Qualitative research

Authors: Nikolaos Mastellos¹, Grzegorz Bliźniuk^{2,3}, Dorota Czopnik⁴, Mark McGilchrist⁵, Andrzej Misiaszek⁶, Piotr Bródka⁶, Vasa Curcin⁷, Josip Car¹, Brendan C Delaney⁸, Anna Andreasson⁹

¹ Global eHealth Unit, Department of Primary Care and Public Health, School of Public Health, Imperial College London, London, United Kingdom

² Faculty of Cybernetics, Military University of Technology, Warsaw, Poland

³ The National Centre for Healthcare Systems, Warsaw, Poland

⁴ Department of Gastroenterology and Hepatology, Medical University in Wrocław, Wrocław, Poland

⁵ Division of Population Health Sciences, University of Dundee, Dundee, United Kingdom

⁶ Department of Computational Intelligence, Wrocław University of Technology, Wrocław, Poland

⁷ Department of Primary Care and Public Health Sciences, School of Medicine, King's College London, London, United Kingdom

⁸ Department of Surgery and Cancer, Imperial College London, London, United Kingdom

⁹ Department of Neurobiology, Care Sciences and Society, Division of Family Medicine, Karolinska Institutet, Stockholm, Sweden

Corresponding author: Dr N.Mastellos, Department of Primary Care and Public Health, School of Public Health, Imperial College London, 3rd Floor Reynolds Building, St Dunstan's Road, London, W6 8RP, United Kingdom, Email: n.mastellos@imperial.ac.uk

Abstract

Background: Recruitment of study participants is a challenging process for health professionals and patients. The TRANSFoRm clinical trial tools enable automated identification, recruitment and follow-up in clinical trials, potentially saving time, effort and costs for all parties involved.

Objective(s): This study evaluates the acceptability and feasibility of TRANSFoRm to improve clinical trial recruitment in primary care.

Methods: A feasibility study was conducted in three general practices in Poland. Participants were physicians and patients with Gastro-Oesophageal Reflux Disease. Semi-structured interviews were held to obtain feedback about the usefulness, ease of use and overall experience with the TRANSFoRm tools and to identify potential usability issues. Data were analysed thematically.

Results: A total of five physicians and ten patients participated in the study. Physicians were satisfied with the usefulness of the system, as it enabled easier and faster identification, recruitment and follow-up of patients compared with existing methods. Patients found the TRANSFoRm apps easy to use to report patient outcomes. However, they also felt that the apps may not be useful for patients with limited exposure to smartphone and web technologies. Two main usability issues were identified: physicians could not access the result of the randomisation at the end of each visit, and participants could not locate the follow-up reminder email.

Conclusions: This study provides new evidence on the acceptability and feasibility of TRANSFoRm to enable automated identification, recruitment and follow-up of study participants in primary care trials. It also helps to better understand and address users' requirements in eHealth-supported clinical research.

Keywords: Electronic Medical Records, Gastroenterology / GERD / Dyspepsia, Primary Care, Quality of Life, Research Ethics / Informed Consent

Background

Randomised controlled trials (RCTs) provide a powerful study design for the evaluation of healthcare interventions and have been widely accepted as the gold standard of clinical research. However, many studies fail to reach their pre-specified sample targets within the planned timeframe and budget. A recent review of 114 trials in the United Kingdom found that only 31% met their original recruitment targets, while 53% achieved their goals after extending the length of the trial [1]. Similarly, a study of 41 trials in the United States found that only 34% achieved or exceeded their targets, while 24% failed to recruit more than half of their original sample size [2]. This is particularly worrying because usually clinical trials succeed or fail based on whether they are powered enough to test the efficacy of a drug, medical device or health intervention. Low recruitment is often addressed by extending the length of a trial until the required sample size is reached. However, this creates extra costs for funders and results in delays in the rollout of potentially effective interventions [3]. Recruitment of study participants in primary care poses additional challenges and can be particularly problematic in international and/or cross-national, multi-centre studies when multiple practices are involved [4, 5]. Primary care recruitment takes place in a highly stressful and time-pressured environment, where busy physicians approach eligible patients directly within their consultations and invite them to take part. As a result, recruitment can be slow with physicians often failing to translate the initial enthusiasm into recruitment targets [6].

Despite significant advancements in information technology, recruitment remains a highly laborious and time-consuming process. The increased adoption of electronic health record (EHR) systems in primary care offers the opportunity for real-time identification, recruitment and follow-up of study participants. Eligibility criteria can be checked without disrupting the clinician's workflow, by querying the EHR of the presenting patient. Electronic case report forms (eCRF) can integrate with EHR systems to support automated data collection of elements present in the patient's EHR, thereby increasing data quality and completeness and reducing the time and costs of recruitment [7, 8]. Electronic patient-reported outcome measures (ePROM) apps enabling data collection either via the web or via the participant's smartphone can further increase the accuracy, completeness and timeliness of data in clinical research [9, 10].

The Translational Medicine and Patient Safety in Europe (TRANSFoRm) project team have developed a digital platform to support clinical trial recruitment in primary care. **Figure 1** shows the TRANSFoRm clinical trial workflow and the system components involved. These include: an enhanced EHR System

Interface; a TRANSFoRm Forms Interface for clinician reported outcome measures (CROM) data collection; a TRANSFoRm compliant Study System that stores the study definitions and collected data; and a component known as Data Node Connector (DNC), which mediates the interaction of the other three. The enhanced EHR System Interface, Forms Interface and DNC are collectively known as the TRANSFoRm eCRF tool. Patient reported outcome measures (PROM) data, collected via the TRANSFoRm web or mobile apps, is incorporated into the eCRF tool. At study completion, data is exported to the researcher for analysis.

In the scenario used in this study, patients with Gastro-Oesophageal Reflux Disease (GORD) visit their doctor for their routine consultation (**Figure 1**). Forms used in the GORD study are highlighted with black boundaries. Potential participants are identified by TRANSFoRm after checking for GORD diagnosis, symptoms and/or treatment prescriptions. Then, the physician checks for the first set of study criteria and, if the patient is eligible and willing to participate, collects informed consent. Next, CROM data from the patient's EHR is extracted to populate fields in the participant's eCRF and the system presents the CROM dataset to the physician for approval. TRANSFoRm then randomises participants and reports allocation instantly to enable initiation of the study intervention. PROM data is incorporated into the eCRF via the TRANSFoRm apps. Researchers can monitor the study status through an interface of the Study System, but they do not have access to study data. Upon study completion, the study dataset is delivered to the researcher through a secure data transport mechanism.

This study assesses the acceptability and usability of TRANSFoRm from the point of view of the physician-recruiter and GORD patient-participant. The effectiveness of TRANSFoRm will be evaluated in a cluster RCT investigating the question "*what gives most symptom relief and improvement in quality of life in patients with Gastro-Oesophageal Reflux Disease (GORD), on demand or continuous use of proton pump inhibitors?*" [11]. Results from the trial will be published separately.

Methods

Study aim and objectives

This study examines physician and patient acceptability of TRANSFoRm with the aim to confirm its feasibility to perform clinical trial recruitment and follow-up in primary care. A secondary aim is to identify potential usability issues prior to the summative evaluation of the tools in the cluster RCT.

Study setting and participants

The study took place in Poland in May 2015. Participants were physicians and patients with GORD. To be eligible, practices had to i) use a mMedica EHR system, ii) nominate one or more physician to participate, iii) be willing and able to identify suitable study participants, and iv) provide informed consent. Patients were eligible if they were i) 18-65 years old, ii) had a GORD diagnosis and/or proton pump inhibitor (PPI) prescription within the last 12 months, iii) were willing to complete PROM data in electronic format, and iv) provided written informed consent.

Between December 2013 and April 2014, scientific personnel from ASSECO, a big EHR vendor in Poland, invited all mMedica practices (n=9420) to participate in the TRANSFoRm cluster RCT. Invitations took the form of pop-up messages on mMedica systems and letters to the practices that expressed initial interest in participating. Fifty-eight practices responded positively. However, only 24 had a mMedica system with a cabinet module installed, which is a prerequisite for the implementation of TRANSFoRm, and therefore were considered for inclusion (**Supplementary file 1**). A total of ten practices, which best fulfilled the trial's practice eligibility criteria [11] and were able or willing to commit to the study protocol requirements, were selected for the trial. Of these, three were invited to participate in the study described here. The selection was based on their readiness to implement the TRANSFoRm system at the time of the study.

Usability studies need five users to discover about 85% of usability problems with a system interface [12]. This level of problem discovery was acceptable considering the well-focused nature of the test, the focus of the study on high-severity problems and the budget limitations. Three systems were tested: 1. eCRF tool for physicians; 2. Web app for patients; and 3. Mobile app for patients. Therefore, five physicians and ten patients were invited to participate. All participants provided written informed consent in accordance with the principles of the Declaration of Helsinki.

Intervention

The intervention was delivered in a controlled, real-life setting. Physicians used the TRANSFoRm eCRF tool to recruit eligible GORD patients and collect baseline data. GORD patients, aged 18-65 years old, visited their doctor and went through the recruitment steps described in the TRANSFoRm study workflow (**Figure 1**). Once recruited, patients were invited by email to use the mobile or web app to fill out and submit PROM data (e.g. Quality of Life questionnaire). Prior to intervention delivery, face-to-

face training was provided to all physicians by qualified study personnel. Patients did not receive any training because the apps were designed to be intuitive to eliminate the need for training in a real-life trial. All tools were installed and tested by qualified scientific personnel from the Centre for Health Information Systems (CSIOZ) and developers from ASSECO in collaboration with the TRANSFoRm project team between January and March 2015.

Data collection

Following recording of CROM/PROM data, semi-structured interviews with physicians and study participants were conducted by a qualified researcher from CSIOZ. The interviews explored users' self-efficacy and perceptions about the usefulness, ease of use, design, usability and overall experience with TRANSFoRm (**Supplementary files 2 and 3**). Each interview lasted for approximately 30 minutes. At the participants' request, all interviews were recorded using paper and pen, transcribed verbatim and translated into English by qualified bilingual personnel.

Data analysis

Interview data were analysed thematically in English using the Ritchie and Spencer's Framework Approach [13]. The analysis was performed by the researcher who collected the data and two independent researchers from the Medical University in Wroclaw and Imperial College London. This included a series of well-established steps to ensure consistency, credibility and traceability of findings. First, analysts familiarised themselves with the data by reading and rereading the transcripts and jotting down notes. Second, they developed a thematic framework by identifying a priori themes from the interview guide, emergent issues raised by the participants, and analytical themes arising from the recurrence of particular experiences. Third, analysts applied the framework to the data in its textual form using index prefixes and annotations. Then, they formed charts by rearranging the data according to major thematic categories from the framework, and, finally, pulled together the data to interpret the whole dataset and provide explanations for the findings [13]. Any discrepancies were resolved by consensus or discussion with a fourth researcher from Karolinska Institutet.

Results

Demographics

Five physicians and ten patients from three practices in three cities (Mielec, Piotrków Trybunalski, and Łódź) participated in this study. Mielec participated with two physicians and five patients; Piotrków Trybunalski with one physician and three patients; and Łódź with two physicians and two patients. The physician group consisted of two male and three female physicians with an average age of 49 years. The GORD patient group had a mean age of 48 years and included six male and four female participants. No further demographic and socio-economic data was collected for the purpose of this study.

Physician acceptability

Overall, physician acceptability of the TRANSFoRm eCRF tool was positive. Respondents highlighted the role of training in increasing confidence with using the system and identified a number of advantages compared with standard practice (**Table 1**).

Self-efficacy

Physicians felt that the system requires some skill to use. The training lasted for approximately an hour. All physicians said that the training was satisfactory and equipped them with the necessary skills to perform patient recruitment.

Usefulness and ease of use

Physicians found the system simple and easy to use. Particularly, they said that identification of potentially eligible patients was quick; randomisation and allocation of study participants simple; and data collection and submission easy. Respondents felt that TRANSFoRm could enable them to recruit patients in an easier and faster way compared with standard practice.

Usability issues

One main usability issue was identified. Physicians said that they would like to access all patient forms at the end of the visit, especially the form with the randomisation result, to be able to confirm each individual randomisation, as per the study protocol. All study forms were automatically stored into the Study System. However, with mMedica EHR no client interface mechanisms were provided to permit these forms to be viewed. Therefore, physicians had to manually record this information.

Patient acceptability

Patients expressed a positive opinion about the usability of the TRANSFoRm ePROM apps. However, they also identified some areas for improvement (**Table 2**).

Self-efficacy

Participants felt confident to use the TRANSFoRm apps without training. However, they also mentioned that some medical terms and abbreviations on the questionnaires were incomprehensible and suggested including some explanation of their meaning for patients to understand what they fill out. Age was identified as a limiting factor to using the apps. Respondents felt that elderly patients may find it difficult to fill out their PROM electronically due to their limited exposure to smartphone and web technologies and suggested giving them the option to use paper-based questionnaires.

Usefulness and ease of use

The general perception was that the apps were simple and easy to use. However, respondents expressed mixed views regarding their usefulness. Half said that, if they had to choose between filling out a questionnaire using the web or mobile app or paper and pen, they would use the apps; one did not show any preference; and the rest would rather use paper and pen.

Usability issues

Participants were concerned about the use of email to invite them to fill out the PROM electronically. Three participants were unable to fill out their questionnaires as the email with the link to complete the PROM data was landed in their spam folder, while one received the email but failed to open the link.

Another point of concern was the repetitive nature of questions and the length of the questionnaires. Some questions were asked twice, at the baseline visit and at follow-up. However, a participant who had participated in many studies and was accustomed to such surveys said that "*the survey was done professionally and aesthetically. It took 14 minutes to complete the PROM. There was no problem with the number of questions*". Despite complaining about the length of the questionnaires, users agreed that they were able to complete their PROM data in a timely manner.

Conclusions

The widespread use of EHR systems in primary care offers the potential to electronically identify, pre-screen and follow up patients using EHR flagging and data collection tools. This study provides

evidence on the physician and patient acceptability of such tools using the example of TRANSFoRm. The findings demonstrate the feasibility of TRANSFoRm to improve the conduct of clinical research in primary care by reducing the time and effort required by physicians and patients to perform recruitment and follow-up. Time and effort are significant determinants of physician and patient participation in research [14-16]. Improvements in participation and therefore recruitment can help researchers to collect sufficient data to precisely and reliably answer their research questions and clinicians to use this data to take clinical decisions and improve care and patient safety.

In line with previous research, our findings show that EHR flagging and data collection tools are well accepted by clinicians and patients. In a similar study in the United Kingdom, the EHR system was used by physicians to identify eligible patients during the consultation, confirm eligibility and collect follow-up data on major clinical outcomes. Both patients and physicians perceived the use of EHR-based tools as an acceptable and feasible method for participant recruitment and follow-up [17]. In another study, the use of clinical trial alerts for the identification of patients whose EHR data met specific eligibility criteria resulted in increased physician participation, recruitment efficacy and satisfaction, despite the often intrusive nature of alerts [18]. Previous research has shown that physicians often find the pop-up alerts disruptive and frequently ignore them due to lack of time in the consultation [19]. In this study, physicians did not feel this way, but it is unclear whether this was due to the high sensitivity and specificity of the system or the controlled nature of the study.

The results also suggest that participants, especially those with limited exposure to smartphones and/or the Internet, should be given clear instructions on how to access and use the apps online and/or the option to fill out their questionnaires using paper and pen. Training will be necessary to support users with little or no previous experience with smartphones, tablets or computers. Clear instructions on how to access and complete a study questionnaire online should be provided to all participants. In this study, a significant amount of patients failed to provide PROM data as part of the usability study because they lacked instructions on how to locate or open the link which was sent via email.

The study has some limitations. First, the sample size was relatively small to generate fine-grained themes. However, considering the exploratory aim of the study and the homogeneity of participants, the sample was sufficient to discover high-severity usability problems and develop high-level themes [12, 20]. Second, the interviews were conducted in Polish and translated into English by bilingual personnel. Despite efforts to translate verbatim into English, it is possible that some content was not translated

precisely. However, it is unlikely that this has influenced the interpretation of data. Finally, the aim of this study was to assess the acceptability of TRANSFoRm and its feasibility to improve recruitment in primary care trials. Therefore, no conclusive evidence can be drawn about the ability of the system to improve the efficacy and cost-effectiveness of clinical research. The efficacy of the tools will be evaluated in a cluster RCT with the participation of 40 general practices from five countries [11]. By identifying usability issues and by providing recommendations for improvement, the current study helps to better understand and address the needs of different users in eHealth-supported clinical research.

Acknowledgements and declarations

This project has received funding from the European Commission's Seventh Framework Programme for research, technological development and demonstration under grant agreement number 247787. Ethical approval was obtained from the Bioethics Committee of the Lower Silesian Chamber of Physicians in Wroclaw (Ref: 2/NT/2014). The authors declare no conflict of interest.

References

1. McDonald AM, Knight RC, Campbell MK, Entwistle VA, Grant AM, Cook JA, Elbourne DR, Francis D, Garcia J, Roberts I, Snowdon C: **What influences recruitment to randomised controlled trials? A review of trials funded by two UK funding agencies.** *Trials* 2006, **7**:9.
2. Charlson ME, Horwitz RI: **Applying Results Of Randomised Trials To Clinical Practice: Impact Of Losses Before Randomisation.** *British Medical Journal (Clinical Research Edition)* 1984, **289**:1281-1284.
3. Treweek S, Wilkie E, Craigie AM, Caswell S, Thompson J, Steele RJC, Stead M, Anderson AS: **Meeting the challenges of recruitment to multicentre, community-based, lifestyle-change trials: a case study of the BeWEL trial.** *Trials* 2013, **14**:436-436.
4. Bower P, Wallace P, Ward E, Graffy J, Miller J, Delaney B, Kinmonth AL: **Improving recruitment to health research in primary care.** *Fam Pract* 2009, **26**:391-397.
5. Dean SC, Harper CE, Cappuccio FP, Rink E, Dirckx C, Arnout J, Zito F, Iacoviello L: **The challenges of cross-national research in primary health care across Europe.** *Fam Pract* 2005, **22**:341-346.
6. Wilson S, Delaney BC, Roalfe A, Roberts L, Redman V, Wearn AM, Hobbs FD: **Randomised controlled trials in primary care: case study.** *BMJ* 2000, **321**:24-27.
7. Le Jeannic A, Quelen C, Alberti C, Durand-Zaleski I: **Comparison of two data collection processes in clinical studies: electronic and paper case report forms.** *BMC Med Res Methodol* 2014, **14**:7.
8. Walther B, Hossin S, Townend J, Abernethy N, Parker D, Jeffries D: **Comparison of electronic data capture (EDC) with the standard data capture method for clinical trial data.** *PLoS One* 2011, **6**:e25348.
9. Ganser LA, Pearson AS, Pearson DJ: **Data quality and power in clinical trials: a comparison of ePRO and paper in a randomized trial.** In *EPro: Electronic Solutions for Patient-reported Data*. Edited by Byrom B, Tiplady B. Surrey: Gower Publishing Ltd; 2010: 49-78

10. Lane SJ, Heddle NM, Arnold E, Walker I: **A review of randomized controlled trials comparing the effectiveness of hand held computers with paper methods for data collection.** *BMC Medical Informatics and Decision Making* 2006, **6**:23-23.
11. Mastellos N, Andreasson A, Huckvale K, Larsen M, Curcin V, Car J, Agreus L, Delaney B: **A cluster randomised controlled trial evaluating the effectiveness of eHealth-supported patient recruitment in primary care research: the TRANSFoRm study protocol.** *Implement Sci* 2015, **10**:15.
12. Faulkner L: **Beyond the five-user assumption: Benefits of increased sample sizes in usability testing.** *Behavior Research Methods, Instruments, & Computers* 2003, **35**:379-383.
13. Ritchie J, Spencer L: **Qualitative data analysis for applied policy research.** In *Analyzing qualitative data*. Edited by Bryman A, Burgess GR. London: Routledge 1994: 173-194
14. Croughan M: **Factors influencing physician participation in practice-based research network studies: a call for further research.** *J Fam Pract* 2001, **50**:978-979.
15. Verheggen FW, Nieman FH, Reerink E, Kok GJ: **Patient satisfaction with clinical trial participation.** *Int J Qual Health Care* 1998, **10**:319-330.
16. Bell-Syer SE, Moffett JA: **Recruiting patients to randomized trials in primary care: principles and case study.** *Fam Pract* 2000, **17**:187-191.
17. van Staa TP, Dyson L, McCann G, Padmanabhan S, Belatri R, Goldacre B, Cassell J, Pirmohamed M, Torgerson D, Ronaldson S, et al: **The opportunities and challenges of pragmatic point-of-care randomised trials using routinely collected electronic records: evaluations of two exemplar trials.** *Health Technol Assess* 2014, **18**.
18. Embi P, Jain A, Harris CM: **Physicians' perceptions of an electronic health record-based clinical trial alert approach to subject recruitment: A survey.** *BMC Medical Informatics and Decision Making* 2008, **8**:13.
19. Treweek S, Pearson E, Smith N, Neville R, Sargeant P, Boswell B, Sullivan F: **Desktop software to identify patients eligible for recruitment into a clinical trial: using SARMA to recruit to the ROAD feasibility trial.** *Inform Prim Care* 2010, **18**:51-58.
20. Guest G, Bunce A, Johnson L: **How Many Interviews Are Enough?: An Experiment with Data Saturation and Variability.** *Field Methods* 2006, **18**:59-82.

